Better Buildings
U.S. DEPARTMENT OF ENERGY

Better Buildings Residential Network Peer Exchange Call Series:

Meet the Jetsons: Smart Tech and the Home of the Future

January 18, 2018

Call Slides and Discussion Summary

U.S. DEPARTMENT OF ENERGY

Agenda and Ground Rules

- Agenda Review and Ground Rules
- Opening Poll
- Residential Network Overview, and Upcoming Call Schedule
- Featured Speakers:
  - **Mark Milby**, Program Manager – Midwest Energy Efficiency Alliance (MEEA) *(Network Member)*
  - **Tristan de Frondeville** – CEO, SkyCentrics
  - **Carsten M. Steenberg** – CEO PowerWise, Powerhouse Dynamics
- Closing Polls and Announcements

Ground Rules:

1. **Sales of services and commercial messages are not appropriate** during Peer Exchange Calls.

2. Calls are a safe place for discussion; **please do not attribute information to individuals** on the call.

Better Buildings Residential Network

Join the Network

Member Benefits:

- Recognition in media and publications
- Speaking opportunities
- Updates on latest trends
- Voluntary member initiatives
- Solution Center guided tours

Commitment:

- Members only need to provide *one number*: their organization's number of residential energy upgrades per year

Upcoming calls:

- January 25: Beyond Hunches: Using Science to Drive Behavior Change
- February 1: Achieving Results in the Multifamily Sector: Strategies that Hit Home
- February 8: Going for Gold: Medal-Worthy Approaches to Energy Efficiency from Around the Globe
- February 15: New Tools in the Toolbox: A Fresh Take on Financing

Peer Exchange Call summaries are posted on the Better Buildings website a few weeks after the call

For more information or to join, for no cost, email bbresidentialnetwork@ee.doe.gov, or go to energy.gov/eere/bbrn & click Join

Mark Milby
Program Manager
Midwest Energy Efficiency Alliance (MEEA)

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Intelligent Efficiency & Utility Programs: **Reports from the Midwest**

DOE Peer Exchange Call

1/18/2018

MEEA
MIDWEST ENERGY EFFICIENCY ALLIANCE

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Acknowledgements

Insight for this Research

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ecobee
Edison Foundation Institute
EnergySavvy
FirstFuel Software
General Electric
Kansas City Power & Light
MidAmerican Energy
Nest
Nexant
Nicor Gas
NEEP
Retroficiency
Schneider Electric
Simple Energy
University of Chicago
View Dynamic Glass
Xcel Energy

- ACEEE 2013:
  - "…the deployment of affordable next-generation **sensor, control, and communication technologies** that help us **gather, manage, interpret, communicate, and act upon** disparate and often large volumes of data to **improve device, process, facility, or organization performance** and achieve new levels of energy efficiency."

- An easier definition:
  - "taking the friction out of energy efficiency"

- What it enables:
  - Multiple value streams at once
  - New value streams for both customers and program admins
  - Expanded non-energy benefits
  - New gateways to customers
  - More holistic approaches to whole-building energy savings
  - New market adoption strategies

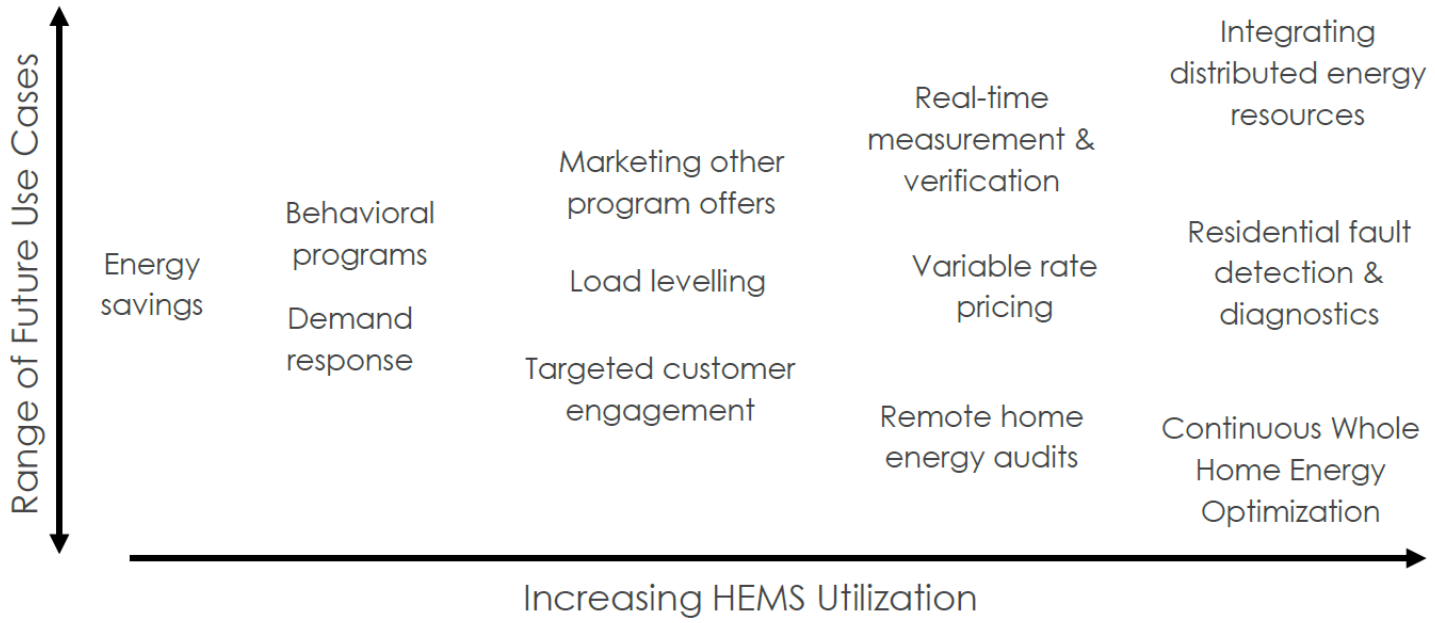


Figure 1: Potential Future Utility HEMS Use Cases

Reports from the Midwest

Some types of intelligent efficiency

1. Home Energy Management Systems
2. Commercial Advanced Lighting Controls
3. Energy Management Information Systems
4. Smart Manufacturing
5. Smart Cities

Home Energy Management Systems

DTE Energy

www.newlook.dteenergy.com/wps/wcm/connect/dte-web/insight/insight-app

Home Energy Management Systems

KCP&L

- Nearly 20,000 smart thermostats in last year and half
- DIY & BYOT options reduce implementation costs by 40%

Home Energy Management Systems

ComEd

- 95,000 device incentives
- ENERGY STAR® certified smart thermostats & qualified products list
- Nest Seasonal Savings and Rush Hour Rewards

Chicago program aims for 1 million 'smart' thermostats

WRITTEN BY

Kari Lydersen
October 8, 2015

There will be one million more smart thermostats in the Chicago area in five years if a new public-private program launched today meets its goals.

Home Energy Management Systems

New Marketplaces

ComEd An Exelon Company MARKETPLACE

Account | Products | Buyer's Guides | Support | (0) Cart

CONNECTED HOME PRODUCTS

Sort By: Featured

Xcel Energy® | STORE

Account | Products & Programs | Buyer's Guides | Support | (0) Cart

CONNECTED HOME PRODUCTS

Sort By: Featured

WEMO® SWITCH SMART PLUG

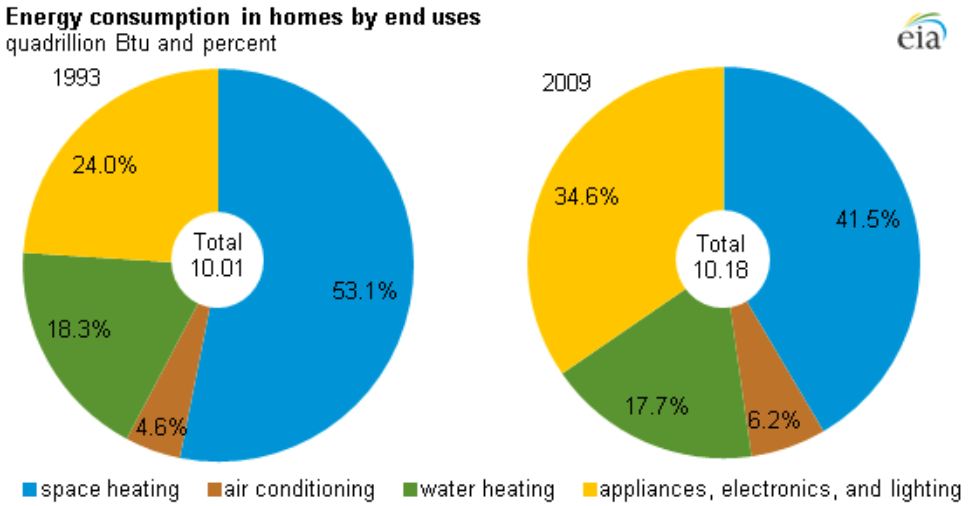
WEMO® INSIGHT ENERGY USE MONITOR

WEMO® NETCAM HD+ WI-FI CA

U.S. DEPARTMENT OF ENERGY

Home Energy Management Systems
Trends to Consider

- Nearly 50% of US residential customers have smart meters installed
  - Out of 62M customers, only 6M are on TOU rates
  - Only 1M on true dynamic rates
- HVAC has dropped to <50% of average home's energy use – rise of appliances



Source: U.S. Energy Information Administration, Residential Energy Consumption Survey.
Note: Amounts represent the energy consumption in occupied primary housing units.

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Summary of Barriers

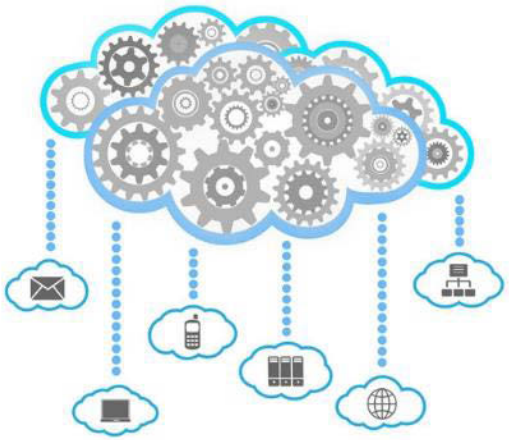
Traditional Market Barriers

- Higher upfront cost
- Lack of awareness
- Product complexity
- Energy savings confidence
- Security/privacy

Summary of Barriers

Data Access and Interoperability

- Data availability
- Data integrity
- Data access
- Interoperability
- "The chasm of pilots"



Thank you!

Mark Milby
Program Manager
Midwest Energy Efficiency Alliance

Presentation Highlights: MEEA (1 of 3)

- **The future is intelligent efficiency.** In the past energy efficiency focused on swapping out equipment, adding equipment, or using a widget to understand the energy savings value. Intelligent efficiency offers new gateways for utilities into behavior and energy usage, new use cases, and expansion into non-energy benefits.

- **Digital engagement can drive energy savings.** More utilities are producing their own apps with energy monitoring and management features that allow customers to take actions to increase efficiency. DTE Energy Co. out of Detroit, Michigan created an app that in combination with a hub device called powerley provides real-time data on energy and power use in a user-friendly format.

Presentation Highlights: MEEA (2 of 3)

- **Increase uptake of smart devices through Do it Yourself and Bring Your Own Device incentives.** Kansas City Power and Light offers a free smart thermostat install to homeowners who provide the thermostat. Nearly 20k smart thermostat installs in 18m. DIY & BYOT options reduced implementation costs by 40%.

- **Use a standard to create a qualified product list for incentives.** Using a standard like Energy Star keeps a utility from appearing to back a particular brand and makes it easy to create a list of quality products

- **Promote a variety of smart home devices to encourage energy savings.** Utility-sponsored online marketplaces that promote a variety of smart devices for the home build recognition of a suite of devices, some of which will encourage energy savings.

Presentation Highlights: MEEA (3 of 3)

- **Traditional approaches to piloting devices may be too slow.** The fast growing smart tech market needs a quick-turnaround approach to piloting to assess devices before customers have moved on.

- **Interoperability between products from different manufacturers is a critical issue.** The market could see a customer backlash if devices aren't made to easily sync up and talk to one another.

Tristan de Frondeville
CEO
SkyCentrics

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SkyCentrics

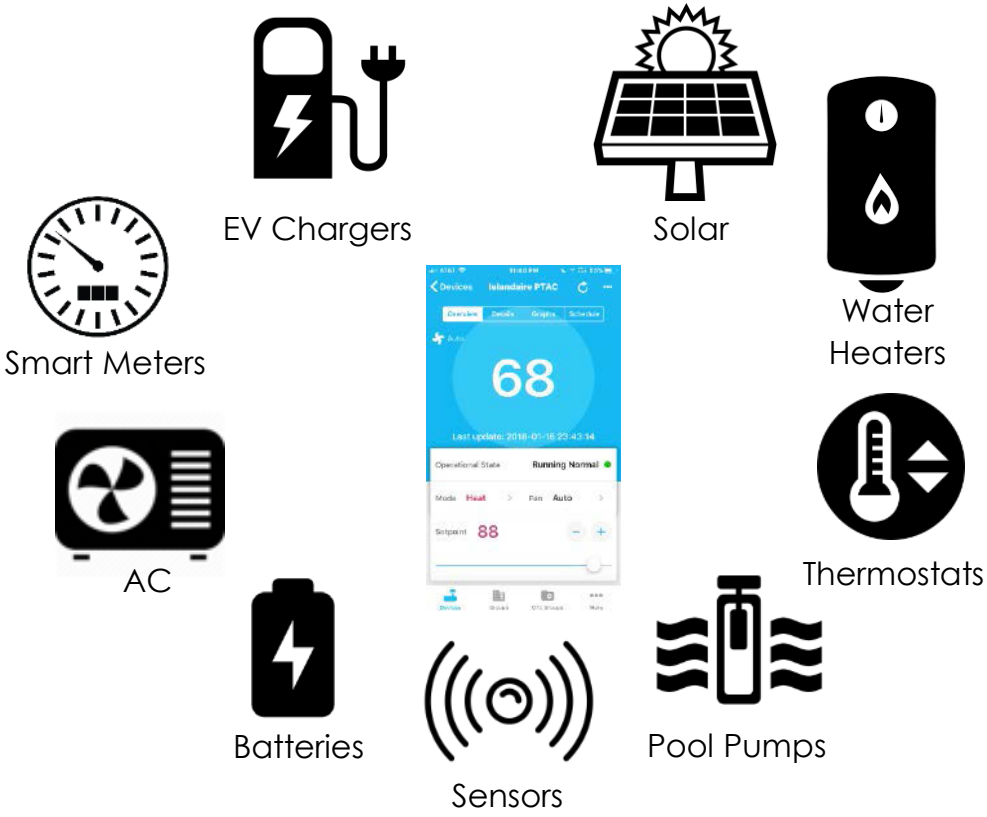
Better Buildings Residential Network | January 2018

What Makes a Home Smart?

SkyCentrics

Thermostats are hot

Smart homes are so much more



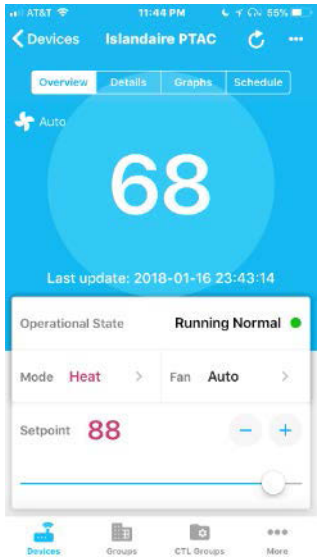
The ‘Jetson’ Home is easy

SkyCentrics

EV Chargers

Solar

Smart Meters



Water Heaters

alexa

AC

Thermostats

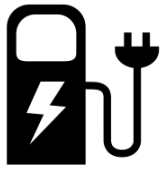
Batteries

Sensors

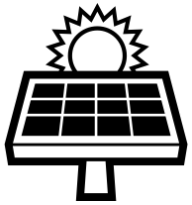
Pool Pumps

The ‘Jetson’ Home is autonomous

SkyCentrics



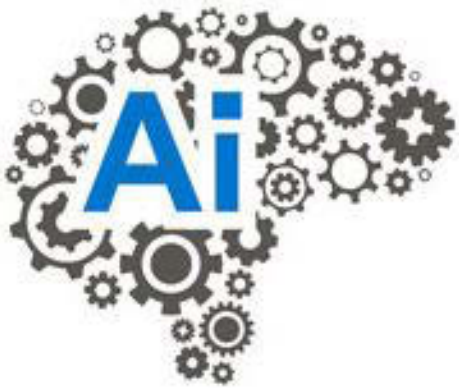
EV Chargers

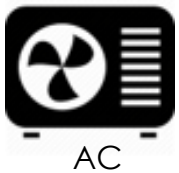


Solar

Smart Meters

Water Heaters





AC

Thermostats

Batteries

Sensors

Pool Pumps

Why Open Standards?

SkyCentrics

- One standard, multiple devices
- Drives Innovation
- Builds a community of developers
- Avoids vendor lock-in
- Scales quickly
- Easy to add devices
- Avoids stranded assets

CTA-2045:
USB for Smart Appliances

- Defined hardware and software interface
- Standard control signals for utilities and homeowners
- Plug-in installation
- Easy OEM integration
- Streaming real time data
- Flexible communications
- AHRI 1380 for commercial buildings

One Platform, Many Connections

SkyCentrics

Real-time data-driven environment and asset management

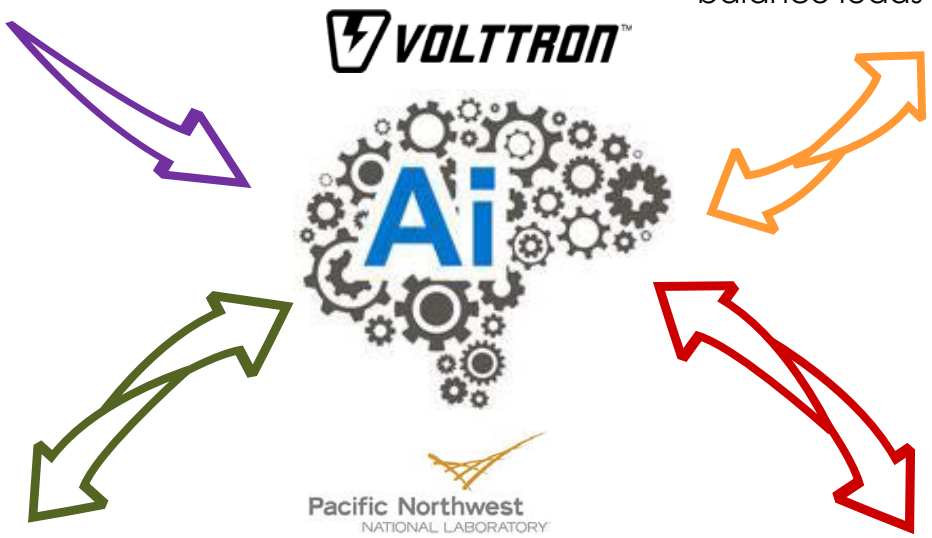
Data Integration

Weather | Utility Pricing | Occupancy

Transactive Energy

Micro-transactions between devices
balance loads to support grid

Blockchain enabled grid



Device Connections

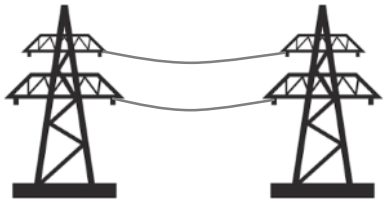
CTA-2045 | Modbus | BACnet | SEP2

Control Automation

Optimized schedules
Quick response for tenant comfort

Making Everyone Happy

SkyCentrics



Utilities

Real-time Control

- Demand response
- Time-of-use pricing
- Reduce infrastructure cost

Lifetime Data

- Demand forecasting
- Capacity planning
- Real time measurement & verification

Homeowners

Lower cost

- "On when you need it, off when you don't"
- Grid-responsive
- More durable appliances
- Utility incentives

Always comfortable

- Pre-heating & cooling
- Occupancy responsive

Builders & Operators

Data driven design

- Cost/performance optimization
- Pre-commissioning review

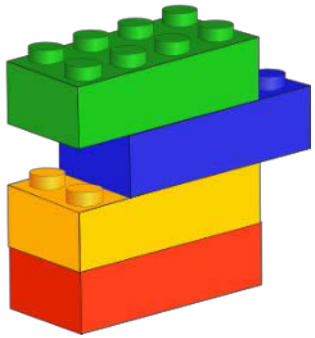
Real-time management

- Remote troubleshooting
- Predictive maintenance
- Continuous commissioning

What to ask from your vendors

SkyCentrics

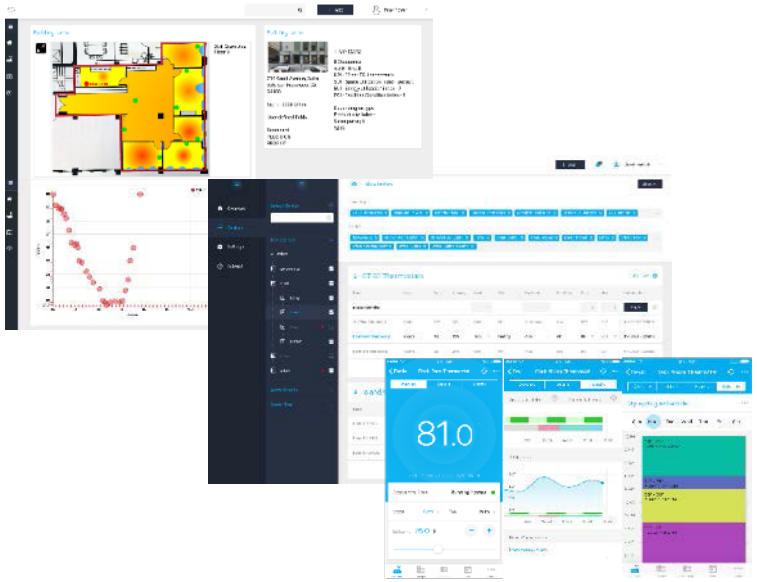
- Rest API?
- Play nice with other vendors?
- Data Access and portability?
- Multiple communication paths?
- Modular? – buy only what you need
- Modern architecture? - easy to add features
- Enterprise features? – grouping, permissions, low latency at scale



Questions?

About SkyCentrics

- Easily deployable, turnkey, low-cost, open platform:
  - Sensors, device and appliance controls
  - AI and machine learning optimization
  - Predictive analytics and fault detection
  - Cloud, web and mobile apps
  - Modular and scalable to millions of devices
- Reduces lifecycle cost of building and real estate by 30%
- Allows buildings to automatically participate in the Smart Grid
- Platform proven with Duke Energy, Con Edison, AO Smith, Islandaire



VOLTTRON™

More About Open Standards

SkyCentrics

- CTA-2045 Demand Response (SkyCentrics) https://www.youtube.com/watch?v=baPmqPgQhDE
- EPRI CEA-2045 Field Demonstration Project (EPRI) https://www.youtube.com/watch?v=BHMssq6_R94
- Alexa voice control of PTAC (SkyCentrics) https://youtu.be/YSQaxz2tzUM
- Water heaters, as sexy as a Tesla? (Rocky Mountain Institute) https://www.rmi.org/news/water-heaters-sexy-tesla/
- What is the Volttron™ Platform? (DoE) https://transactionalnetwork.pnnl.gov/volttron.stm
- Economic Sizing of Batteries for the Smart Home (NREL) https://www.nrel.gov/docs/fy18osti/70684.pdf

The Home of the Future

SkyCentrics

Homeowner-centric

- Controllable
- Programmable
- Responsive
- Adaptive

Money Saving

- Low-cost connected devices
- Energy efficient
- Utility-connected

What it Needs

- Connected devices that play nicely together
- Single co-ordination platform
- Open standards
- Scalable IT platforms
- Big Data & Artificial Intelligence
- Major manufacturer adoption

Presentation Highlights: SkyCentrics

- **Voice control may be cool and attractive, but a push button is effective too.** There's a lot of effort spent trying to understand when people are home; a push button can be just as effective as smart tech.
- **Open standards are important for smart tech proliferation.**
  - WIFI and USB ports allow our computers to be much more powerful.
  - Standards allow a smart tech module on a long lived appliance to be swapped out easily without having to replace the appliance.
  - Open standards facilitate the connection of appliances to the internet, apps, and the grid, allowing the manufacturer to understand how to manipulate appliances to respond in the smartest way possible.

Carsten M. Steenberg
CEO PowerWise
Powerhouse Dynamics

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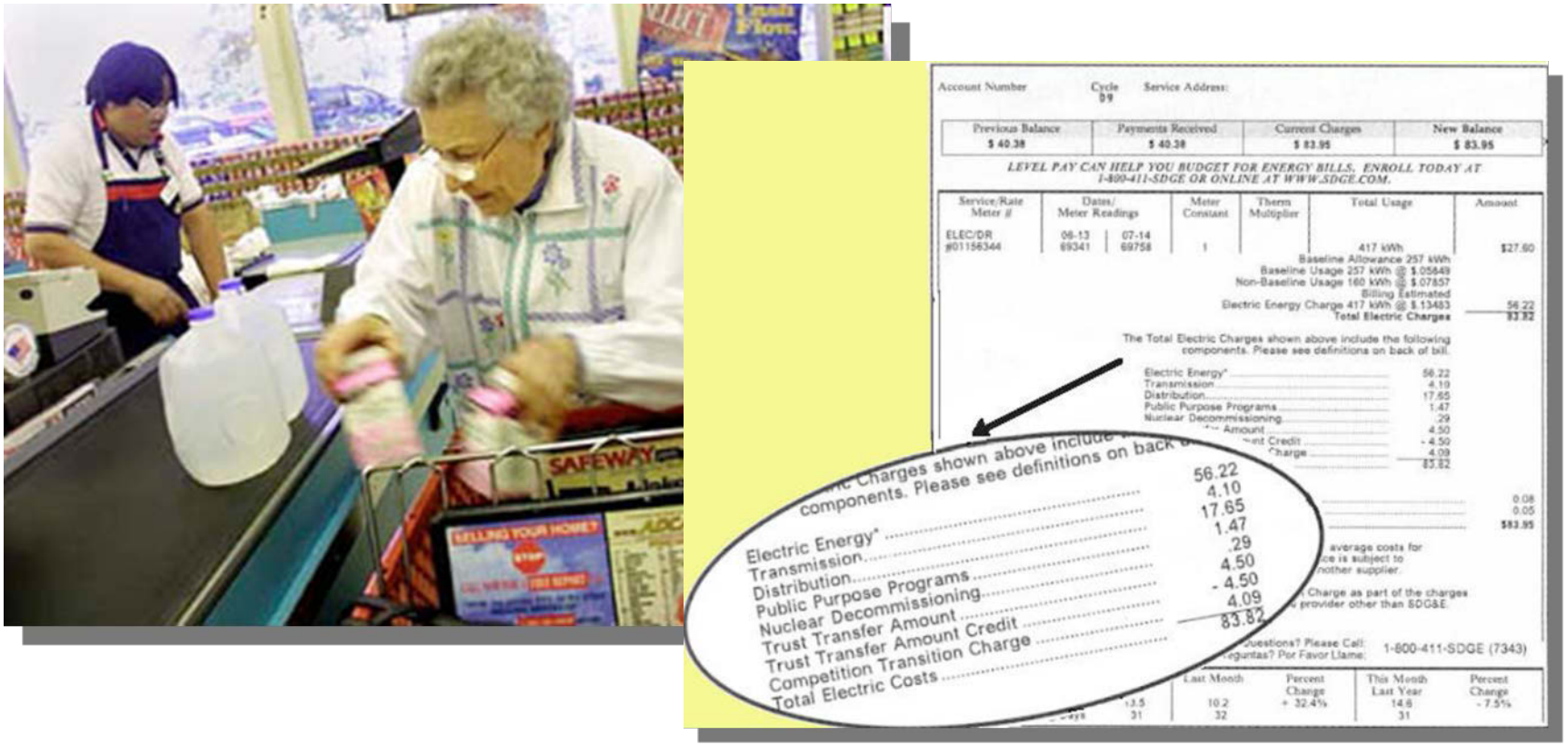
Knowledge is Power!

What if you bought groceries like you buy energy?



This is no way to buy anything!

A Smart Home Energy Monitoring system:

Enables consumers to monitor *and control* (Thermostat & Lighting) their energy use, delivering a real-time energy dashboard.

Provides tailored recommendations on how to reduce energy use *and* leverage renewable energy.

Tracks the impact of actions taken on reducing energy usage, cost, and carbon footprint.

Monitors renewable resources, such as Solar & Wind, to make sure they are working properly, and to maximize available credits and rebates.

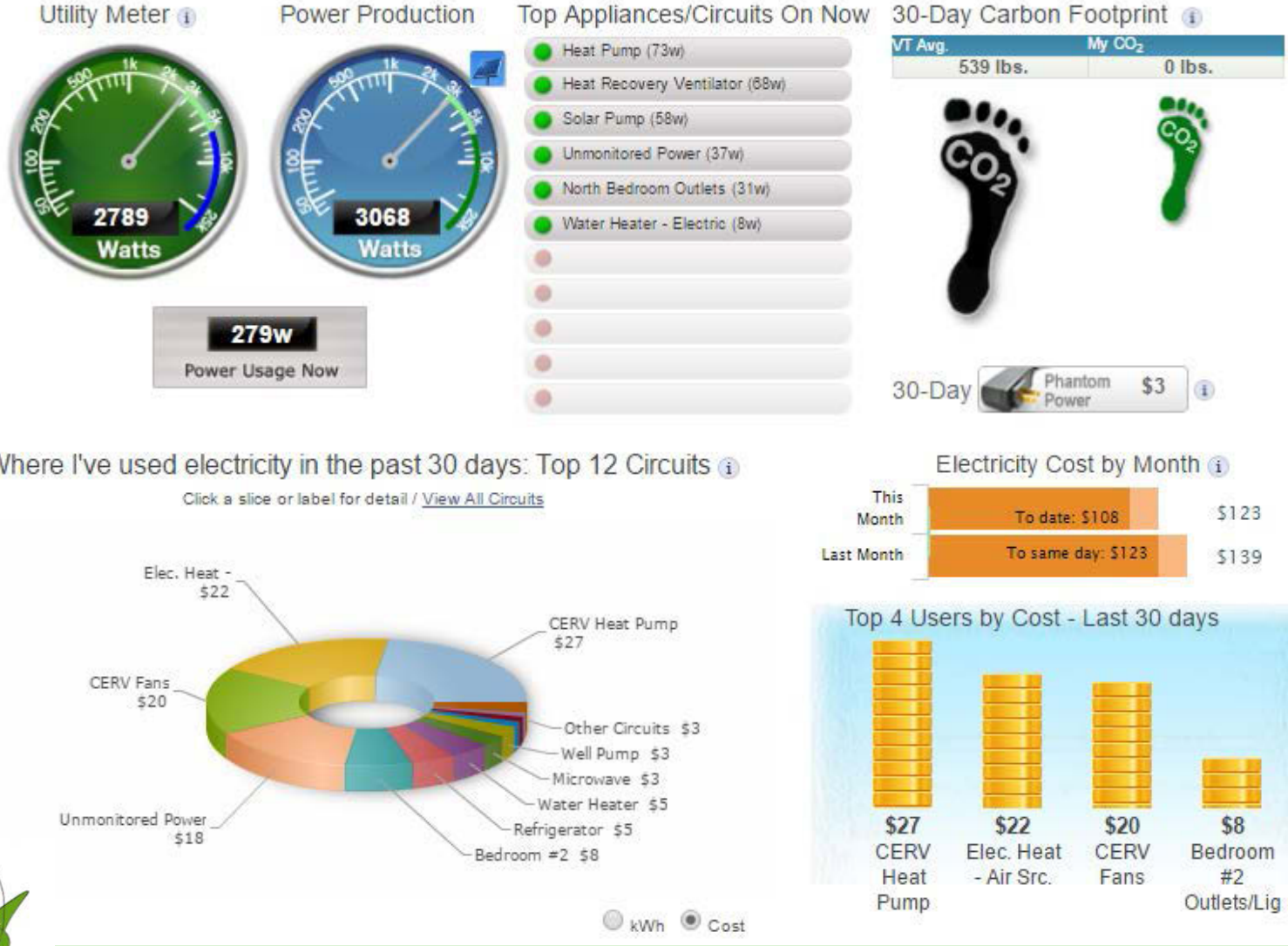
Facilitates 2-way integration of electric vehicles, when available, into the home energy system.

Creates a community of like-minded individuals to compare and benefit from efficiency and renewable experiences.

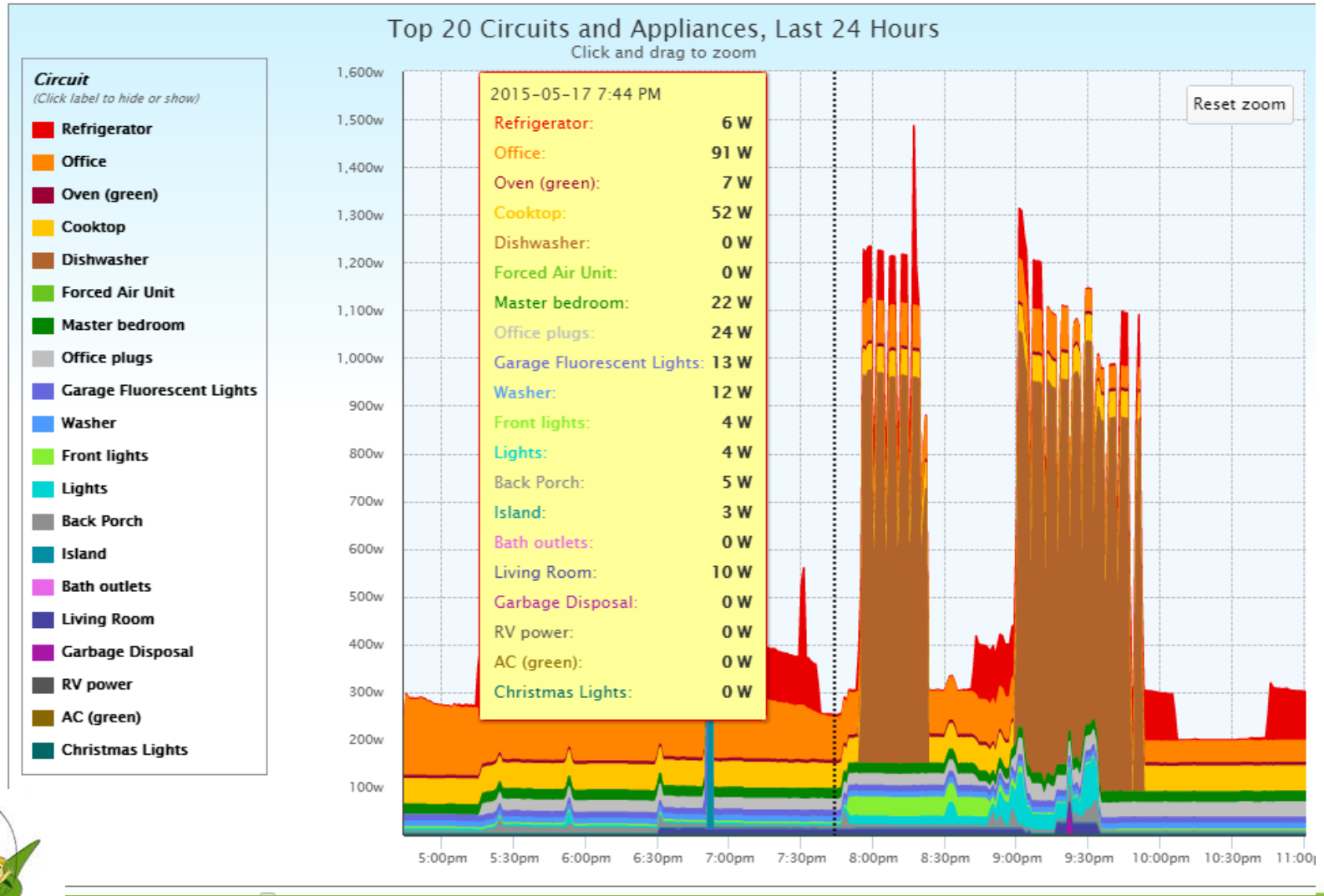
Total Home – Energy - Management System
The components:

Dashboard Feedback works

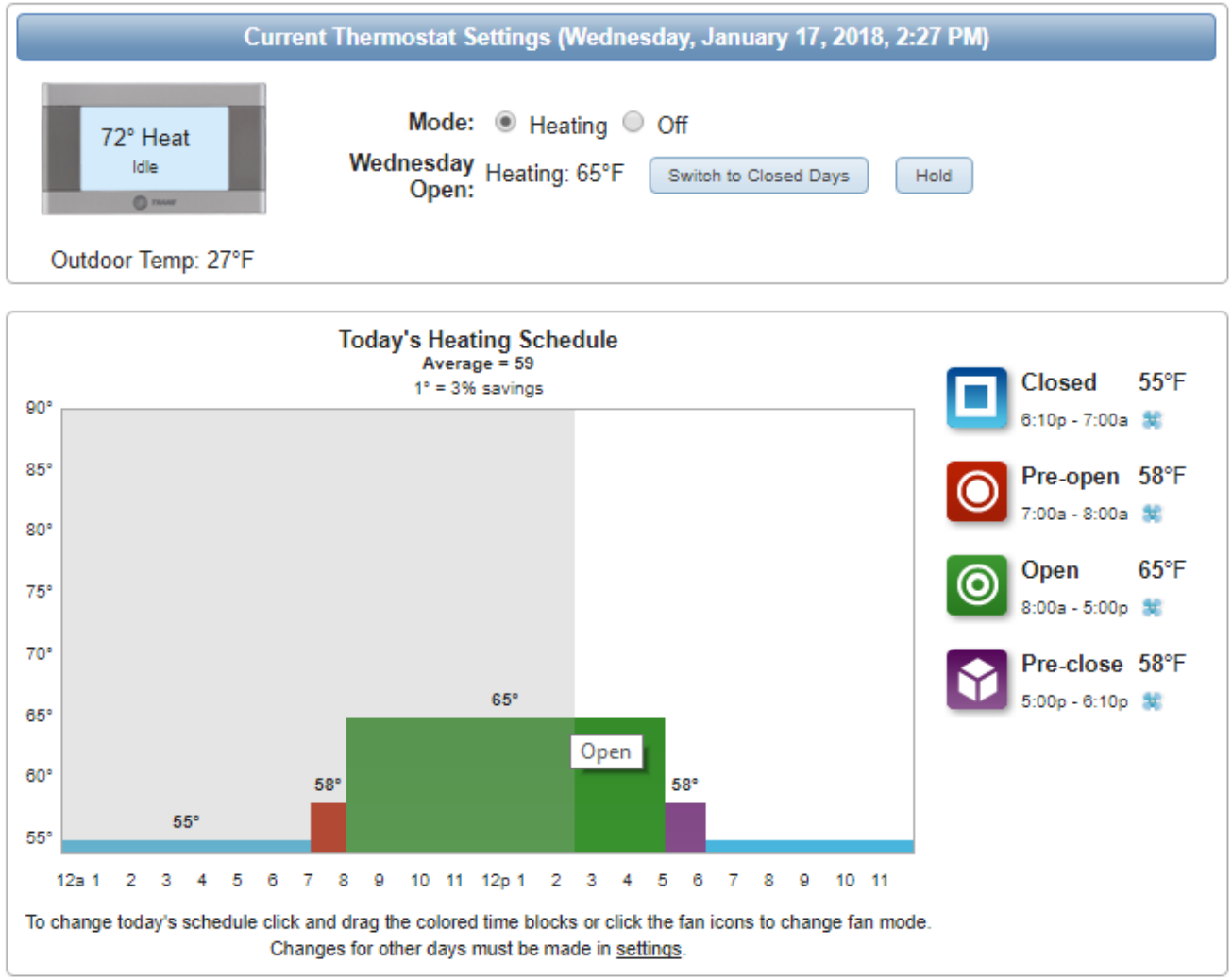
Sample home monitoring system dashboard



Data Granularity is key

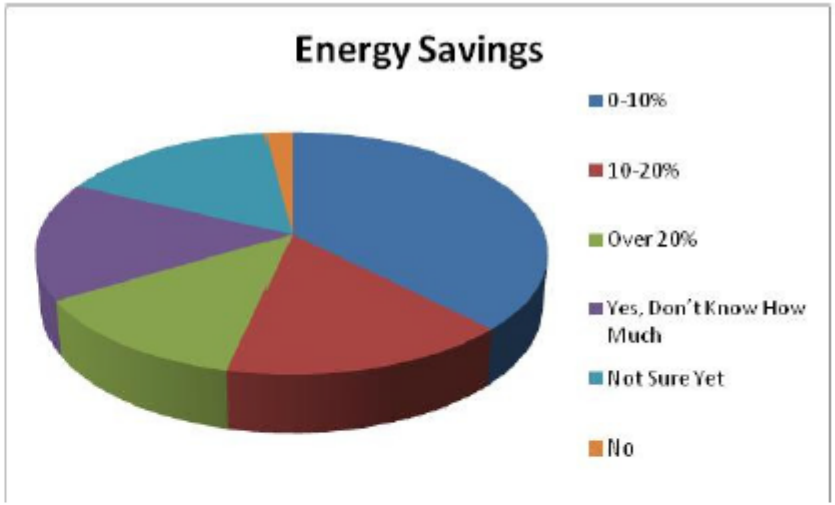


Thermostat control



Survey among Home-owners

- 98% reported energy savings
- 76% reported ongoing value; 24% not sure yet
- 98% rated overall experience good or excellent
- 84% found alerts helpful or very helpful
- 100% would definitely or maybe recommend to a friend



Some of our Partnerships:

neea

Florida Solar Energy Center®
Creating Energy Independence

Rocky Mountain Institute

EPRI
Electric Power Research Institute

Vermont Energy Investment Corporation

Building America
U.S. Department of Energy

nyserda
Energy. Innovation. Solutions.

PHIUS
Passive House Institute US

efficiency MAINE

Passive House Institute

Southern Company

DUKE ENERGY®

Emera

ALABAMA POWER

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Presentation Highlights: Powerhouse Dynamics

- **Surveys show feedback can change behavior and the new generation wants more feedback.** More and more customers want real-time data on their home energy use at a level of detail that allows them to take actions to reduce their energy usage.

- **Utilities can leverage smart tech data to understand customer needs.** Smart tech data can be used for tailored outreach to customers about programs and interventions like air sealing.

- **High resolution data is critical for targeted marketing.** Fine scale data can be used to identify a water leak or other opportunity to save energy and money.

Addenda: Attendee Information and Poll Results

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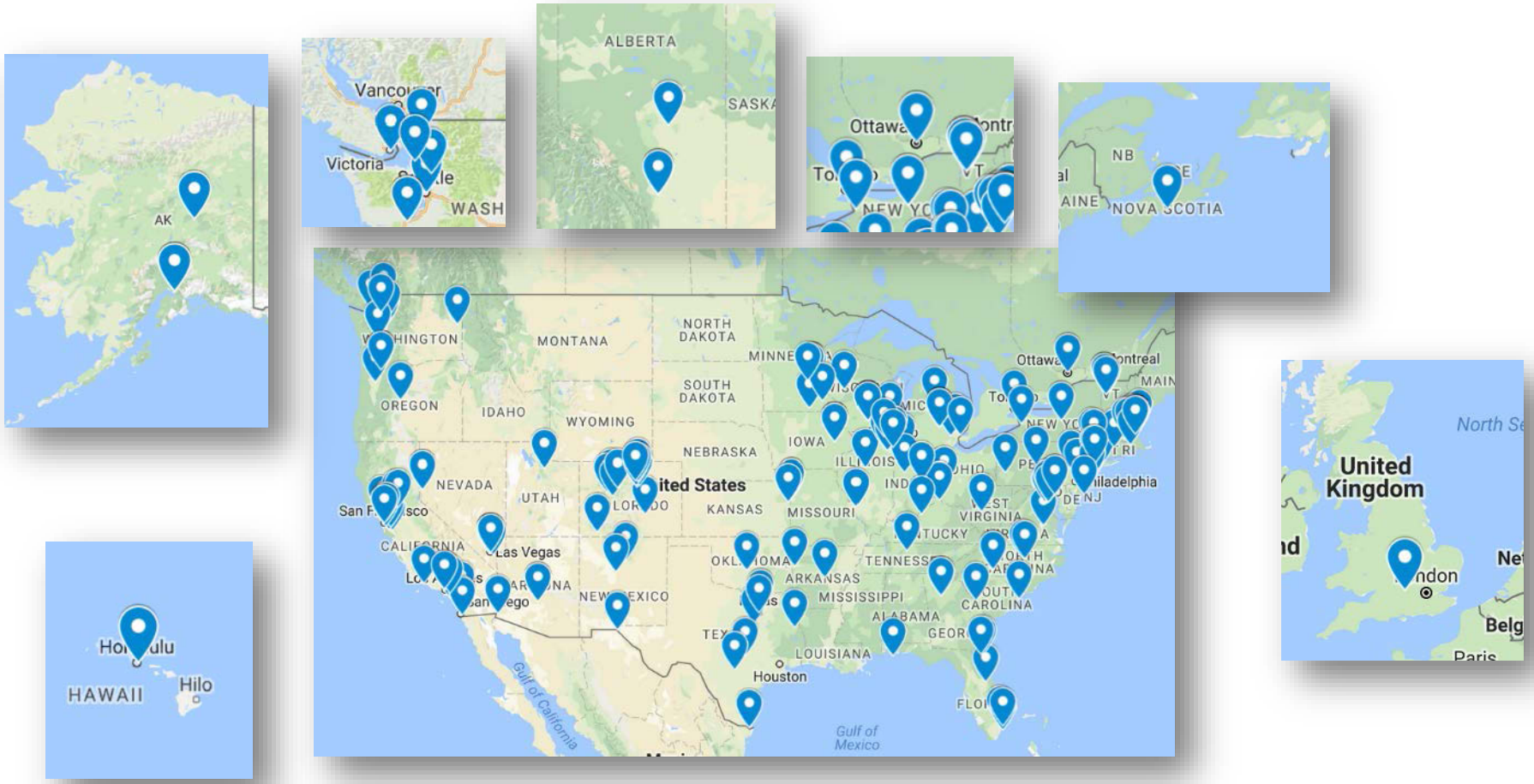
Call Attendee Locations



Call Attendees: Network Members

- Alaska Housing Finance Corporation
- Center for Energy and Environment
- City of Kansas City
- City of Plano
- CLEAResult
- GoodCents
- Home Star Iowa
- La Plata Electric Association
- Midwest Energy Efficiency Alliance (MEEA)
- Northeast Energy Efficiency Partnerships (NEEP)
- Ryan Taylor Architects, LLC
- Southface

Call Attendees: Non-Members (1 of 4)

- Action for Boston Community Development
- About Saving Heat
- AECOM
- AIM Associates
- Alliant Energy
- AnnDyl Policy Group
- Appliance Standards Awareness Project
- Aquanta Inc.
- Association for Energy Affordability (AEA)
- Ballarat Consulting
- Better Climate
- Bio Earth Inc.
- Bonneville Power Administration
- Carolina Smart Homes
- CEE
- CenterPoint Energy
- City County of Denver
- City of Ann Arbor
- Codman Square Neighborhood Development Corp.
- Conservation Connection Consulting
- Coolman Communities, Inc.

Call Attendees: Non-Members (2 of 4)

- D+R International
- Dominion Due Diligence Group
- Earth Advantage
- EfficiencyOne
- Energy Efficiency Alberta
- Energy Solutions Professionals
- Environmental Design / Build
- Equity Communications
- EverGreen Home Energy Consultants
- Evolve
- Franklin Energy
- Freeborn Mower Cooperative Services
- Greenbanc
- GTM Research
- H & H Design and Construction
- HDR Consulting
- HERS-NM, LLC
- HILCO Electric Co-op
- Home Energy Connection, LLC
- Home Office Training & Technology
- Honeywell Smart Energy
- House So Green

Call Attendees: Non-Members (3 of 4)

- International Center for Appropriate & Sustainable Technology (ICAST)
- ICF
- id3A, LLC
- Institute for Market Transformation
- Integral Building & Design
- Ipswich Electric Light Department
- Itron
- LEENA Labs
- Lockheed Martin
- Lundquist Architectural Engineering, PLLC
- Lutron
- Madison Gas and Electric (MGE)
- Mid Michigan Community Action
- National Association of Home Builders (NAHB)
- National Fuel
- Navigant
- Navitas Partners, Inc.
- NC Sustainable Energy Association (NCSEA)

Call Attendees: Non-Members (4 of 4)

- U.S. Energy Information Administration (EIA)
- Unico, Inc.
- University of Michigan
- V3 Power
- Waite & Associates
- Western Electricity Coordinating Council (WECC)
- Whirlpool Corp

Opening Poll

- Which best describes your organization's experience with smart technology residential energy efficiency?
  - Some experience/familiarity – ***49%***
  - Very experienced/familiar – ***24%***
  - Limited experience/familiarity – ***22%***
  - No experience/familiarity – ***6%***
  - Not applicable – ***0%***

Closing Poll

- **After today's call, what will you do?**
  - Seek out additional information on one or more of the ideas – ***69%***
  - Consider implementing one or more of the ideas discussed – ***20%***
  - Make no changes to your current approach – ***9%***
  - Other (please explain) – ***2%***